Five-Year Review Report

Second Five-Year Review

for

Boundary Road Landfill
(fka Lauer 1 Landfill)

Village of MENOMONEE FALLS

WAUKESHA COUNTY, WISCONSIN

September 2007

PREPARED BY:

Wisconsin Department of Natural Resources
Plymouth, Wisconsin

Approved by: Date:

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List of Acronyms

ARAR	Applicable or Relevant and Appropriate Requirement
BETX	Benzene, Ethylbenzene, Toluene, and Xylene
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
DCE	Dichloroethene
DDT	Dichloro-Diphenyl-Trichloroethane
ES	Enforcement Standards
FY	Fiscal Year
GEMS	Groundwater and Environmental Monitoring System
GIS	Geographic Information System
HDPE	High-Density Polyethylene
MCL	Maximum Contaminant Level
mg/L	Milligrams per Liter
MW	Monitoring Well
NCP	National Contingency Plan
NPL	National Priorities List
NR	Natural Resources (as in "NR 140.28, WAC")
NRWQC	National Recommended Water Quality Criteria
O&M	Operation and Maintenance
ORC	Office of Regional Counsel (Region 5)
OSWER	Office of Solid Waste and Emergency Response
PAH	Polycyclic Aromatic Hydrocarbons
PALs	Preventative Action Limits
PCE	Perchloroethylene or Tetrachloroethylene
PCOR	Preliminary Closeout Report
POTW	Publicly Owned Treatment Works
ppb	Parts per billion or ug/L (water) and ug/kg (soil/sediment)
ppm	Parts per million, or mg/L (water) or mg/kg (soil/sediment)
PRPs	Potentially Responsible Parties
QAPP	Quality Assurance Project Plan
RA	Remedial Action
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act of 1976
RD	Remedial Design
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RP	Responding Party
RPM	Remedial Project Manager (U.S. EPA)
SARA	Superfund Amendments and Reauthorization Act of 1986

List of Acronyms, cont.

SOW	Statement of Work
TCE	Trichloroethene
THF	Tetrahydrofuran
U.S. EPA	United States Environmental Protection Agency
UU/UE	Unlimited Use or Unrestricted Exposure
VOC	Volatile Organic Compounds
WAC	Wisconsin Administrative Code
WDNR	Wisconsin Department of Natural Resources
WMWI	Waste Management of Wisconsin

Executive Summary

The remedy at the Boundary Road Landfill Superfund Site is expected to be protective of human health and the environment when all groundwater clean-up goals are achieved. In the interim, exposure pathways that could result in unacceptable risks are being controlled.

Hazardous substances, pollutants, or contaminants remain at the Site. Therefore, the operation and maintenance (O&M) program required by the remedial action (RA) must continue at the Site. Additionally, access to the Site must continue to be controlled. The remedy currently protects human health and the environment because the landfill cap adequately provides protection against direct contact with unacceptable levels of Site contaminants. The groundwater flow regime is controlled and monitored to prevent further migration of groundwater contaminants from the Site. Currently, there are no known users of contaminated groundwater emanating from the Site. Surface water is currently being protected through gradient control at the Site and routine monitoring.

Long-term protectiveness of the remedial action will be verified by continued monitoring of landfill leachate, landfill gas, and groundwater. Current monitoring data indicate that the remedy is functioning as required to provide protection to and of the groundwater.

Exposure assumptions, toxicity data, clean-up levels, and remedial action objectives (RAOs) used at the time of the remedy selection appear to be valid. Due to the implementation of the selected remedy, the risk at the Site has decreased. Data indicate that there continues to be no ecological risks, and human health risks are addressed by the remedy. Long-term protectiveness requires maintenance of the Site remedy components and compliance with institutional controls (ICs). Compliance with ICs will be ensured by implementing, maintaining, and monitoring ICs.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name *(from WasteLAN)*: **Lauer 1 Sanitary Landfill**		
EPA ID *(from WasteLAN)*: **WID058735994**		
Region: 5	**State: WI**	**City/County: Menomonee Falls/Waukesha**

SITE STATUS	
NPL status: ■ Final □ Deleted Other (specify) Closed Site	
Remediation status (choose all that apply): □ Under Construction □ Operating ■ Complete	
Multiple OUs? □ YES ■ NO	**Construction completion date:** 09/28/1999
Has Site been put into reuse? □ YES ■ NO	

REVIEW STATUS	
Lead agency: □ EPA ■ State □ Tribe □ Other Federal Agency _____	
Author name: Thomas A. Wentland	
Author title: Project Manager	**Author affiliation: Wisc. Dept. of Natural Resources**
Review period: 04/27/2007 to 09/07/2007	
Date(s) of Site inspection: 04/27/2007	
Type of review: ■ Post-SARA □ Pre-SARA □ NPL-Removal only □ Non-NPL Remedial Action Site □ NPL State/Tribe-lead □ Regional Discretion	
Review number: □ 1 (first) ■ 2 (second) □ 3 (third) □ Other (specify) _____	
Triggering action: □ Actual RA On-site Construction at OU #____ □ Construction Completion □ Other (specify)	□ Actual RA Start at OU#____ ■ Previous Five-Year Review Report
Triggering action date *(from WasteLAN)*: 09/27/2002	
Due date *(five years after triggering action date)*: 09/27/2007	

Five-Year Review Summary Form, cont'd.

Issues:

- Possible increase in chloride and sulfate along eastern Site boundary.
- O&M Plan needs to address new monitoring and leachate head wells.
- Insufficient monitoring data to evaluate inward groundwater gradient on the west side of the Site.
- The ICs have not been fully evaluated.
- Long-term stewardship must be assured which includes maintaining and monitoring ICs.

Recommendations and Follow-up Actions:

- Review chloride and sulfate concentrations on east side of the Site to determine if additional evaluation is warranted.
- Revise O&M Plan to include new monitoring and leachate head wells.
- Identify and install any necessary monitoring points on west side of the Site to evaluate gradients.
- A review of the ICs is underway to assure that the remedy is functioning as intended with regard to the ICs and to ensure effective procedures are in-place for long-term stewardship at the Site.
- An IC Plan will be developed which includes planning for additional IC evaluation activities as needed and planning for long-term stewardship.

Protectiveness Statement(s)

- The remedy at the Boundary Road Landfill Superfund Site is expected to be protective of human health and the environment when all groundwater clean-up goals are achieved. In the interim, exposure pathways that could result in unacceptable risks are being controlled.
- Long-term protectiveness requires maintenance of the Site remedy components and compliance with ICs. Compliance with ICs will be ensured by implementing, maintaining, and monitoring ICs.

Other Comments:

- Date of last Regional review of Human Exposure Indicator: 07/10/06
- Human Exposure Survey Status: Current Human Exposure Controlled
- Date of last Regional review of Groundwater Migration Indicator: 02/28/07
- Groundwater Migration Survey Status: Contaminated Groundwater Migration Under Control
- Ready for Reuse Determination Status: Protective for People Under Current Conditions

Five-Year Review Report

I. Introduction

The purpose of the five-year review is to determine whether the remedy at a site is protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in five-year review reports. In addition, five-year review reports identify issues found during the review, if any, and identify recommendations to address them.

The Wisconsin Department of Natural Resources (WDNR) in consultation with the United States Environmental Protection Agency (U.S. EPA) is preparing this five-year review report pursuant to the **Comprehensive Environmental Response, Compensation and Liability Act** (CERCLA) § 121(c), 42 U.S.C. § 9621(c), and the National Contingency Plan (NCP). CERCLA § 121 states:

If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with Section 104 or 106, the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.

The U.S. EPA interpreted this requirement further in the NCP; 40 CFR §300.430(f)(4)(ii) states:

If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above such levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.

WDNR, in consultation with U.S. EPA Region 5, conducted the five-year review of the remedy implemented at the Boundary Road Landfill Superfund Site in Menomonee Falls, Wisconsin. This review was conducted by the State Project Manager for the Site from April 27, 2007 through September 7, 2007. This report documents the results of the review.

This is the second five-year review for the Boundary Road Landfill Site. The triggering action for this review is the September 27, 2002 issuance of the first five-year review report. This is a statutory review that will examine significant Site developments over the past five years. Significant Site developments include O&M of a groundwater cut-off slurry wall, a landfill cap, a leachate collection system, a landfill gas extraction system, and access control features. O&M also includes the monitoring of groundwater, surface water, leachate, and landfill gas. At the present time, the waste mass left in place precludes unlimited use and unrestricted exposure.

II. Site Chronology

Chronology of Site Events

Event	Date
Landfill Operation Dates	03/05/1958 to 07/03/1971
Initial Discovery of Contamination	10/20/1979
Site Nominated to the National Priorities List (NPL)	06/14/1983
NPL Listing	09/13/1984
Effective Date of Remediation Contract between WDNR and WMWI	08/01/1990
Remedial Investigation (RI) Complete	08/01/1993
Feasibility Study (FS) Complete	11/20/1994
Proposed Plan Issued	02/15/1995
Record Of Decision (ROD) Signature	03/21/1996
Remedial Design Complete	09/18/1997
Pre-final Inspection	11/16/1998
Preliminary Close-Out Report	09/28/1999
Previous Five-Year Review	09/27/2002

III. Background

Physical Characteristics

The Boundary Road Landfill is located in the northeastern portion of the Village of Menomonee Falls in Waukesha County, Wisconsin. See Figure 1. The Site address is W124 N8925 Boundary Road, and the section location is the SE 1/4 of Section 1 T8N, R20E. The Site occupies approximately 58 acres of a 75-acre tract of land. The Site is situated in an urbanizing area, with mixed surrounding land uses, including some residential, industrial, and commercial land uses. A refuse collection operation has been maintained on the property since the Site began operation. See Figure 2.

Land and Resource Use

The Boundary Road Landfill began operation in 1954 as part of a sand and gravel operation and ceased operations in 1971. Waste Management of Wisconsin (WMWI) or its predecessor companies have maintained ownership of the landfill. Because leachate was seeping to surface water next to the Site, WMWI installed a slurry wall in the early 1980s along the southern perimeter of the Site to reduce leachate movement to surface water. Access to the Site is controlled by fencing or natural barriers. The entire landfilled area is covered by an impermeable cap. Except for a small portion of the Site that has an asphalt paved parking lot designed into the cap to be used for truck parking by a WMWI refuse collection operation, the Site is covered by grass and mowed. The current and future plan for the Site is to maintain it as a grassed area with no additional uses anticipated at this time. The refuse collection operation is expected to continue into the foreseeable future. Surrounding land uses are residential to the east and industrial/commercial to the north, west and south. These uses have not changed appreciably in the immediate area of the Site for many years and are presumed to remain the same in the future.

History of Contamination

The original landfill volume was about 1.3 million cubic yards of waste with an average depth of 30 feet. The original cover ranged in depth from 0.5 to 8.0 feet with an average depth of 3.5 feet. When the Site ceased operation in 1971, it was closed and covered commensurate with industry practice at that time. The landfill is unlined, which allowed hydraulic connection of the underlying and adjacent glacial till to the landfill. Although the majority of the landfill is underlain by clay till, there is some sand and gravel in the northeast corner of the Site. Due to the fact that waste was placed below the groundwater table, outward migration of leachate provided a means for landfill contaminants to reach the surrounding aquifer.

Initial Response

As a result of State enforcement actions, WMWI installed an approved landfill cover with vegetation. WMWI also completed installation of a slurry cutoff wall and leachate collection system. All of this work was completed on or before December 1981. The landfill was nominated by WDNR to be placed on the Superfund NPL in 1983 and was placed on the list in 1984. Waste Management of Wisconsin entered into an Environmental Repair Contract with WDNR in 1990 to investigate and remediate the landfill pursuant to State statutes. Waste Management of Wisconsin has been monitoring and maintaining the Site since its closure in 1971.

Basis for Taking Action

Contaminants found in the groundwater at the Site during the Remedial Investigation (RI) include:

Volatiles

Ketones: Compounds found in resins, paint removers, cement adhesives, and cleaning fluids (e.g., acetone, 2-butanone, 2-hexanone, 4-methyl-2-pentanone, and isophorone).

Benzene, Ethylbenzene, Toluene, and Xylene (BETX) Compounds: Partially water-soluble products from gasoline, oil, and other hydrocarbon products.

Chlorinated Ethenes: Chlorinated ethenes, including tetrachloroethene (PCE), trichloroethene (TCE), dichloroethene (DCE), and vinyl chloride. These compounds are common industrial compounds.

Chlorinated Ethanes: Chlorinated ethanes, including 1,1,2,2-tetrachloroethane, 1,1,2-trichloroethane, 1,1,1-trichloroethane, 1,2-dichloroethane, 1,1-dichloroethane, and chloroethane. These compounds are common industrial solvents and represent a potential degradation sequence.

Semi-volatiles

Phenols: A group of chemicals of similar composition used in adhesives, epoxies, plastics, and a variety of synthetic fibers and dyes. Compounds in the group include chlorinated, methylated, and nitrified phenols. Benzoic acid, a carbolic acid, is also included with the phenols because it may be a degradation product of these compounds.

Chlorinated Benzenes: Used as solvents and reagents in a variety of chemical manufacturing processes and materials, including certain pesticides (e.g., Dichloro-Diphenyl-Trichloroethane (DDT). Compounds in this group include chlorobenzene; hexachlorobenzene; 1,3-dichlorobenzene; 1,4-dichlorobenzene; 1,2-dichlorobenzene; and 1,2,4-trichlorobenzene.

Polycyclic Aromatic Hydrocarbons (PAHs): A group of compounds associated with and derived from coal and oil (e.g., naphthalene, pyrene, etc.). They are also by-products of the incomplete combustion of carbonaceous materials.

Phthalates: Compounds associated with plastics and plastic-making processes.

Contaminants found in the leachate at the landfill during the RI include:

BETX Compounds
Chlorinated benzenes
Phenols and PAHs
Chlorinated ethenes
Chlorinated ethanes
Total Ketones
Tetrahydrofuran
Styrene
Methylene Chloride
Nitrobenzene
N-nitrosodiphenylamine
Carbazole
Dibenzofuran

Contaminants found in surface soils at the landfill during the RI include:

PAHs
Pesticides
Xylenes
Bis(2-ethylhexyl)phthalate
Aroclor 1260 and 1254

A baseline risk assessment conducted during the RI indicated that several media were found to be of concern under particular exposure conditions to human and/or ecological populations. The following is a summary of the media which were estimated to pose a health concern during the RI, as well as the nature of the exposure (e.g., ingestion of groundwater) that poses a health concern:

Groundwater: It was assumed that, currently and in the future, people ingest contaminated groundwater from on-site or off-site monitoring wells, or inhale contaminants released from using water, such as showering, from on-site or off-site monitoring wells.

Surface soils: It was assumed that, in the future, on-site residents ingest or come into dermal contact with contaminated surface soils at the Site.

Sediment: It was assumed that, in the future, on-site residents ingest contaminated sediment.

Surface water: It was assumed that, currently and in the future, sensitive aquatic organisms may be impacted from chemicals detected in surface water.

Groundwater was a medium of concern as a result of a baseline risk assessment hazard index estimate greater than one. Surface soils, sediment, and surface water were potential media of concern based on a baseline risk assessment cancer risk estimate greater than 10^{-6}, but less than 10^{-4}. Since surface soils, sediment, and surface water pose risks of less than 10^{-4}, these media are within U.S. EPA's acceptable risk range.

IV. Remedial Actions

Remedial Action Objectives

The ROD for the Boundary Road Landfill Superfund Site was signed on March 21, 1996. Remedial action objectives (RAOs) were developed as a result of data collected during the RI to aid in the development and screening of remedial alternatives to be considered for the ROD. The RAOs for Boundary Road were divided into the following groups:

The remedial action objective for surface soils is:

Reduce potential future exposure to contaminants by ingestion and dermal contact.

The remedial action objectives for landfill gas are:

Reduce off-site migration of landfill gas.

Control the release of on-site landfill gas to the atmosphere.

The remedial action objective for surface water is:

Minimize the landfill's potential impact on surface water quality.

The remedial action objectives for groundwater are:

Maintain leachate head levels established for the Site.

Maintain an inward groundwater gradient (where the head inside the landfill is lower than the head in the adjacent area outside the landfill) at the Site.

Reduce the concentration of contaminants that exceed Natural Resources (NR) 140 groundwater quality standards at Site wells outside the waste management area.

Remedy Selection

The major components of the remedy selected in the ROD include the following:

A new landfill soil cover system was constructed that met state solid waste requirements. The cover was constructed of a six-inch grading layer, two feet of compacted clay, 1.5 feet of frost protection/rooting zone, and six inches of topsoil. The cover was seeded and vegetation established. A service road was constructed on the final cover to allow service vehicle access for O&M. Surface water control at the Site was incorporated into the final cap design. At the time of remedy construction, a portion of the Site was used by an active WMWI refuse collection operation. To allow for its continued operation, the area of the Site being used for this purpose was capped with a sufficient thickness of asphalt to allow for heavy truck traffic, prevent contact with the waste, and minimize infiltration.

A new leachate control system was constructed in the northeast area of the landfill. This system and the existing leachate control system adjacent to the slurry-cut off wall along the southern perimeter of the Site were connected to a new forcemain to convey the leachate to the Milwaukee Metropolitan Sewerage system.

An active landfill gas extraction system was installed to collect gases generated by the Site and minimize the potential for gas migration. This system consists of vertical and horizontal extraction pipes connected to a vacuum extraction system that extracts gas from the depths of the waste. Extracted gas is burned by an automatic flare system.

Institutional controls in the form of deed restrictions are in place to prevent unauthorized excavation, groundwater use, and installation of drinking water wells on the landfill.

Fencing and natural barriers limit and control access to the landfill.

Remedy Implementation

In an Environmental Repair Contract # SF-90-01 signed with WDNR, WMWI agreed to perform a Remedial Investigation/Feasibility Study (RI/FS), a Remedial Design (RD) and a Remedial Action (RA). The effective date of the Environmental Repair Contract is August 1, 1990. The RD was completed in conformance with the ROD and was approved by WDNR on September 18, 1997.

The RA took place in two phases. The original design for the remedial action was based on re-using all the on-site cover soils to complete reconstruction of the final cover system. However, as the project progressed, it became apparent that the on-site soils would be exhausted prior to cover completion. The construction activities completed in 1997 included approximately 26.4 of the 45.5 acres of final cover soils placement; approximately 12 acres of asphalt paving; installation of three leachate extraction wells; installation of the majority of the landfill gas and leachate forcemain transfer piping; and seeding, fertilizing, and mulching the portion of the

landfill soil final cover surface. Construction resumed in July 1998, using a new off-site source of cover material. The 1998 construction activities consisted of 19.1 acres of final cover soil placement; installation of the blower-flare station; and seeding, fertilizing, and mulching of the soil final cover. That construction was completed in October 1998. WDNR has determined that all remedial action activities were performed according to specifications.

Institutional Controls

Institutional controls are required to ensure the protectiveness of the remedy. Institutional controls are non-engineered instruments such as administrative and legal controls that help to minimize the potential for exposure to contamination and protect the integrity of the remedy. Institutional controls are required to assure long-term protectiveness for areas which do not allow for unlimited use or unrestricted exposure (UU/UE).

At this Site, ICs are required where waste is left in place (i.e., under the soil cap) and where clean-up levels exceed health-based standards. Restricted areas will be shown on an IC map that will be part of an IC Plan developed by U.S. EPA in consultation with WDNR.

The table below summarizes existing institutional controls for these restricted areas and their corresponding IC objectives:

Media, remedy components & areas that do not support UU/UE based on current conditions	***Objectives of IC***	***Title of institutional control instrument implemented***
Capped Area Boundary Road Landfill Property – Area of the Site with NR 504.06 landfill cap; area of surface water pond and leachate collection system; and methane gas flare station area	Prohibit residential use of the areas and prohibit interference with the cap	Restrictive Covenant (Under Review)
Paved Parking Lot and Refuse Collection Operation on Boundary Road Landfill	Prohibit residential use	Restrictive Covenant (Under Review)
Site remedial components: Subtitle D cap Methane gas collection and flare system Leachate collection and pumping system	Prohibit interference with the systems	Restrictive Covenant (Under Review)
Groundwater – Area of the Site where groundwater plume exceeds performance standards on-site. (to be included in the IC Plan)	Prohibit groundwater use until clean-up standards are achieved	Restrictive Covenant (Under Review)

In April 2007, WDNR sent a request to WMWI requesting that WMWI conduct an IC Study and perform specific IC evaluation activities. Waste Management of Wisconsin agreed and submitted an IC Study in August 2007; however, it was not complete. U.S. EPA has requested that additional information be submitted for the IC study as required in WDNR's IC study request letter.

The August 2007 IC Study produced by WMWI presented responses to the eight IC topics described in the April 10, 2007 WDNR IC Study request letter. The text below lists the eight topics and a summary of the responses.

1. Demonstrate that existing proprietary controls have been properly recorded and are free and clear of all liens and encumbrances.

   The Site is situated on portions of Parcels MNFV 0004998003 and MNFV 0004998004 in the Village of Menomonee Falls, Wisconsin. Property deeds exist for these parcels. Deed restrictions on these parcels have been filed with the local government entity (Waukesha County, Wisconsin). These deed restrictions prohibit the following:

   a. Unauthorized excavation on the Site, other than for the purposes of implementing, maintaining or repairing the remedial actions required by Environmental Repair Contract or the ROD.

   b. Unauthorized consumptive or other use of groundwater underlying the Site.

   c. Unauthorized installation, construction or use of water supply wells on the Site.

   The last transaction regarding this property occurred in 1996. The Chicago Title Insurance Company produced a title commitment associated with that transaction. The Chicago Title Insurance Company also produced a Letter Report that showed real estate transactions, mortgages, leases and agreements since the last title commitment. Together, these documents present a complete picture of the restrictions and encumbrances on the property. Waste Management of Wisconsin stated that no encumbrances identified therein negatively impact proprietary controls.

   U.S. EPA and WDNR will review these determinations in the IC Plan. WDNR could find no evidence of the deed restrictions being recorded with Waukesha County.

   Fencing and natural barriers serve to limit and control physical access to the Site.

2. Demonstrate that existing proprietary controls were signed by a person or entity that owned the property at the time of signature.

   The property deeds show a predecessor company to WMWI as the owner of the Site property. This predecessor company was subsequently merged into WMWI. The deed restrictions for the Site property were also signed by WMWI.

U.S. EPA and WDNR will review these determinations in the IC Plan.

3. Demonstrate that governmental controls are currently in effect.

   The ROD issued for the Site addresses on-site impacts and on-site ICs. Therefore, there are limited governmental controls to evaluate for the Site. WDNR regulations prohibit installing a water supply well in a known contaminated aquifer or within 1,200 feet of a landfill without first being granted a formal written variance to this prohibition. Enforcement of this water supply well prohibition is dependent upon the property owner or licensed well driller contacting WDNR prior to well installation. The Site is a listed Superfund Site on the WDNR database, which is reviewed in conjunction with any permitting of new water supply wells.

   Zoning authority of the local municipality also restricts use of the Site through the prohibition of certain land uses.

   U.S. EPA and WDNR will review these determinations in the IC Plan.

4. Evaluate whether existing controls cover the entire area that needs to be restricted.

   Existing proprietary controls described above restrict unauthorized activities within the Site property, and governmental controls restrict land uses on the Site and regulate groundwater uses within 1,200 feet of the Site. There is no known condition or information available that would indicate restrictions outside of these areas are currently required.

   Waste Management of Wisconsin did not submit maps to WDNR to document the restrictions described above. U.S. EPA and WDNR will review the determinations of the previous paragraph in the IC Plan.

5. Assess objectives, restrictions and performance standards of the ICs.

   Prohibition of building on the Site is controlled through deed restrictions and local zoning authority.

   Prohibition of unauthorized interference with remedy components is controlled through deed restrictions.

   Prohibition of groundwater use is controlled by deed restrictions and State authority to prohibit installation of water supply wells within 1,200 feet of a landfill without issuance of a variance.

   U.S. EPA and WDNR will review these determinations in the IC Plan.

6. Assess monitoring and compliance with ICs.

Waste Management of Wisconsin and/or its contractors and consultants typically visit the Site at least once per month as part of ongoing O&M activities. Periodic inspections of the Site are also performed by WMWI. No signs of obvious or habitual trespass have been observed during these visits. There have also been no signs of unauthorized excavation, groundwater use, or installation of water supply wells on the Site. Also, no evidence of obvious or habitual tampering with remedy components at the Site has been observed. Current uses of Site property are consistent with the ICs in place for the Site.

There is no known available information that indicates any new water supply wells have recently been installed within 1,200 feet of the Site.

Land uses have not changed appreciably in the immediate area of the Site since execution of the ROD, and those uses are presumed to remain the same in the future.

Waste Management of Wisconsin recorded the deed restrictions for these properties. Therefore, as owner of the properties, WMWI is aware of the use restrictions.

U.S. EPA and WDNR will review these determinations in the IC Plan.

7. Discuss effectiveness of ICs.

   Based on the information provided in the above sections, WMWI concluded the ICs in place at the Site are effective and functioning as anticipated. Site activities, as restricted by the ICs, do not adversely impact human health and the environment. The proprietary controls in place for the Site are binding on the current landowner, as well as subsequent land owners, since they are recorded with the Property Deed. Waste Management of Wisconsin stated that, as such, these controls are considered to "run with the land."

   U.S. EPA and WDNR will review these determinations in the IC Plan.

8. Recommendations

   Waste Management of Wisconsin recommends that an annual review of any changes in surrounding land uses and zoning occurs to determine if the changes are compatible with existing ICs in place at the Site. U.S. EPA and WDNR will review this determination in the IC Plan.

The ICs in place for the Site appear to be protective of human health and the environment. In consultation with WDNR, U.S. EPA will develop an IC Plan for additional IC evaluation activities to include preparation of paper and electronic versions of maps of all areas that require land and groundwater use restrictions, review of the enforceability and effectiveness of the ICs, and a provision to amend the O&M Plan or prepare a stand-alone document to include mechanisms to ensure regular inspection of ICs at the Site, annual certification, and a communications plan. Waste Management of Wisconsin will be responsible for implementing these items.

Current Compliance: Based on inspections and interviews, WDNR is not aware of Site or media uses which are inconsistent with the stated objectives of the ICs. The remedy appears to be functioning as intended.

Long-Term Stewardship: Long-term protectiveness at the Site requires compliance with use restrictions to assure the remedy continues to function as intended. To assure proper maintenance and monitoring ICs, long-term stewardship procedures will be reviewed and a plan developed. The plan will include regular inspection of ICs at the Site and annual certification by WMWI to WDNR that ICs are in place and effective. Additionally, use of a communications plan and use of a one-call system should be explored for long term stewardship.

System Operation/Operation and Maintenance

Waste Management of Wisconsin is conducting long-term monitoring and maintenance activities according to the O&M Plan that was approved by WDNR on February 16, 2000. The primary activities associated with landfill O&M include the following:

1. Site Security. The Site security system consists of a six-foot high chain link fence with three-strand barbed wire and locking gates controlling access to the Site. Fence maintenance includes inspections at least once per quarter. Locking gates are maintained at the access points to the Site from adjacent roadways. An additional fence encloses the landfill gas blower/flare to discourage entry by unauthorized personnel and prevent vandalism. Warning signs are placed along the perimeter fence and on the locking gate.

2. Landfill Cover System. Maintenance of the soil cover system involves visual inspection of the landfill cover system at least semi-annually. Maintenance activities include repair of any settled areas, areas void of vegetation, and areas affected by erosion. The entire Site is mowed as needed with at least one mowing per year. Maintenance of the asphalt-paved area includes repair of any cracks or settled areas that are identified during the semi-annual inspections.

3. Surface Water Management. The surface water ditches require mowing and possibly reshaping to better control runoff. Mowing ditches on the same schedule as the landfill cover will control excess vegetation within the ditches. Drainage ditches are mowed and maintained to provide the design flow conditions.

4. Landfill Gas Extraction System. The physical condition of the flare and flame arrester are inspected routinely and are repaired as needed. The blower fan, coupling, and electric motor are standard equipment and are maintained in accordance with the manufacturer's recommendations.

5. Leachate Extraction System. Leachate pumps are routinely inspected for signs of corrosion or wear. The intake screens are cleaned and worn cables and discharge hoses replaced as needed. The three vertical extraction wells constructed in the northeast area of the Site at the time of RA implementation were replaced in October 2005 at essentially the same locations.

The replacement wells were deepened to reach the base of refuse in order to enhance leachate recovery within this area of the Site, so as to achieve target leachate levels and to maintain inward gradients.

V. Progress Since the Last Review

Minor final cover soil erosion repair was completed in 2003 with the addition of soil to eliminate identified cover rivulets. These areas then received seed, fertilizer, and mulch to complete the work.

Waste Management of Wisconsin installed additional monitoring wells at the Site in 2006 to better understand groundwater gradients and groundwater quality at the Site. Monitoring wells were installed in the northeast corner of the Site (MW-107) and along the eastern boundary (P117) to better understand groundwater flow and groundwater quality in this side of the landfill.

Waste Management of Wisconsin installed five leachate head wells at the Site in 2007 to better track progress toward achieving target leachate levels and to maintain inward gradients.

The following table lists the issues and recommendations from the previous Five-Year Review Report of 2002. It also shows the completion status of each recommendation.

Issues from Previous Review	Recommendations/ Follow-up Actions	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
Insufficient Monitoring	Installation of additional monitoring wells	WMWI	12/31/02	Additional monitoring wells installed	2006
Institutional Controls	Expedite adoption	WMWI	12/31/02	ICs in place, but no record of deed restrictions being recorded	----
Erosion Ruts	Repair ruts and increase inspections	WMWI	12/31/02	Erosion repair completed	2003

VI. Five-Year Review Process

The review process included the following activities:

- Administrative Components of the Five-Year Review Process
- Community Notification and Involvement
- Document Review
- Data Review
- Site Inspection
- Local Interviews

Administrative Components of the Five-Year Review Process

The WMWI project manager for the Site was notified of the start of the five-year review process by letter dated March 12, 2007. The letter briefly explained the five-year review process in addition to identifying the planned completion date and suggesting a date for WDNR and U.S. EPA representatives to conduct a Site inspection.

Community Notification and Involvement

On June 25, 2007, an ad was run in the Milwaukee Journal Sentinel newspaper explaining that the five-year review process had started and briefly explained the process. The newspaper ad also identified the major components of the remedy. A completion date of September 2007 was listed as well as identifying Thomas A. Wentland of WDNR as the contact person for additional information. A copy of the ad is included as Attachment 1 to this report. The name and address of the local information repository, as shown in the ad, is:

Village of Menomonee Falls Public Library
W156 N8446 Pilgrim Road
Menomonee Falls, WI

Document Review

The five-year review consisted of a review of relevant documents, covering O&M requirements, monitoring data, contractual obligations and legal responsibilities. See Attachment 2.

Data Review

Environmental post-construction monitoring data has been collected since 1999. A long-term sampling and analysis plan has been implemented to show compliance with the ROD. Three categories of wells (down gradient monitoring, down gradient private, and inward gradient monitoring) were selected to monitor the RA.

Results from the down gradient monitoring well samples from June 2006 (the last full round) indicate that volatile organic compounds (VOCs) were not detected at concentrations that exceed the Enforcement Standards (ESs) of Wisconsin Administrative Code (WAC) Chapter NR 140, with the following exceptions:

- An exceedance for benzene in deep well P107 in the northeastern corner of the Site and
- An exceedance of chloroform at shallow well MW117 on the eastern side of the Site (this was a first-time occurrence of this compound at this well and may not be Site-related).

No VOC detections have been recorded in private wells east of the Site throughout the last five-year monitoring period, with the exception of an estimated value for naphthalene below the Preventative Action Limit (PAL) at one location in June 2005. No detections occurred in the most recent sampling round (June 2006).

Tetrahydrofuran (THF) is the most persistent VOC in groundwater at the Site and is generally decreasing in concentration in monitoring wells over time. THF has not exceeded the ES in any monitoring wells throughout the last five years of monitoring except at deep well P103 on the eastern side of the Site in June 2005. Benzene, chloroethane, and 1,1,1-trichloroethane are other VOCs that have historically been detected in monitoring wells at the Site. However, since June 2003, only benzene has exceeded the ES at two on-site monitoring well locations (P107 in June 2004, June 2005 and June 2006; and TW24R in June 2005). Very low levels of acetone, toluene, and methylene chloride (which are common laboratory contaminants) were detected at some Site monitoring wells for the first time in samples collected in June 2005 and June 2006. In addition, several chlorinated compounds (e.g., 1,1-dichoroethene and 1,2-dichlorethane) were also detected for the first time at even fewer monitoring wells. It is uncertain whether these first-time detections are landfill-related, since these compounds are generally not present in analyses of landfill leachate. Since most of these additional compounds are below ESs and PALs or are estimated low concentrations (j-flagged), they are not believed to be of particular significance at this time. Concentrations of these constituents at the Site will continue to be tracked through the routine groundwater monitoring program.

A review of inorganic water quality data indicates that in two recent sampling events (June 2006 or March 2007), three inorganic parameters, dissolved chloride, iron, and manganese, were variously present in four to six monitoring wells, each at concentrations that exceed an ES. However, these parameters are categorized as public welfare-based rather than public health based. Public welfare-based parameters are regulated because they impart aesthetically unpleasing characteristics to the water but are not necessarily harmful to a person's health. Public health based parameters, on the other hand, are regulated due to their carcinogenic and mutagenic impact to human health. In addition, two private wells also contained dissolved iron exceeding the ES in samples collected in June 2005, but high iron concentrations in private wells are a common occurrence in southeastern Wisconsin. Another public welfare parameter, sulfate, did not exceed its ES in the latest sampling event (March 2007). Reviews of historical monitoring results indicate that dissolved sulfate and chloride may be increasing in concentration over time at certain monitoring wells on the eastern side of the Site. The cause for this possible increase is unclear; however, these constituents are being seen in groundwater at concentrations higher than total concentrations found in analyses of landfill leachate from the Site. Sulfate and chloride increases are not occurring at the private wells east of the Site. Water quality in this area of the Site will continue to be monitored through the routine monitoring program. Additional review of this issue may be warranted to evaluate the cause of this condition along the eastern boundary of the Site if further increases in concentrations of these constituents are observed. As of the latest sampling in June 2006, two monitoring wells contained dissolved arsenic that exceeds the ES. Arsenic is another naturally occurring metal in the area. Further, 15 monitoring wells contain one or more dissolved metals (typically arsenic, iron, and manganese) that exceeded PALs of WAC Chapter NR 140.

Under Wisconsin law, exceedances of the PALs are considered to be addressed if a remedy has been put in place and efforts are being made to reduce the concentration of the identified parameters. Such is the case at this Site.

The ROD for the Site requires that an inward groundwater gradient be maintained at the landfill. Existing monitoring points and the two newly installed monitoring wells on the eastern side of the Site, and five leachate head wells within the landfill were used to define groundwater flow in the vicinity of the Site and the presence of inward gradients. Monitoring records indicate that an inward gradient is being maintained on the eastern side of the Site where private wells are in close proximity to the Site, as well as on the northern and southern sides of the Site. Water quality information from the western side of the Site suggests that leachate is contained within the Site, but additional hydraulic information in this area would aid in interpreting conditions on this side of the Site. Records also indicate that the shallow groundwater gradient across the Site is from north to south resulting in groundwater flow toward the cut-off slurry wall and leachate extraction system, as designed. Data indicate water quality impacts are not evident on the western or northern sides of the Site, suggesting that inward gradients exist at these locations, supporting the groundwater flow interpretation. All extraction systems required by the ROD have been installed and are operating properly.

Leachate quality has remained relatively consistent during the review period, with constituent concentrations below discharge standards established by the receiving Publicly Owned Treatment Works (POTW). Landfill gas probe monitoring has shown no evidence of landfill gas migration at the Site.

The electronic database maintained by WDNR entitled "Groundwater and Environmental Monitoring System" (GEMS) was used to evaluate the Site conditions. This database contains historical as well as recent monitoring results, required by the ROD. Data has been collected by both Site personnel and State agencies.

Site Inspection

Representatives of WDNR and U.S. EPA met with the project manager for WMWI, Closed Sites Management Group, on April 27, 2007, to conduct an inspection of the Boundary Road Landfill. The purpose of the inspection was to assess the protectiveness of the remedy. The inspection focused on the following areas: fencing, the integrity of the cap, the operation of the landfill gas extraction system, and the condition of the groundwater monitoring wells. Institutional controls in the form of deed restrictions have been placed on the property. No significant issues have been identified regarding the cap, gas extraction system, Site security, and O&M.

The Site was in very good condition. Inspection of the landfill cover revealed an established vegetative cover, and the asphalt portion of the cover was also in good repair. Interviewing the Site manager revealed that the grass is mowed at least once a year with additional mowing as needed to maintain a short and protective grass cover. A professional asphalt installation contractor inspects the asphalt portion of the cap on a semi-annual schedule and performs repairs as needed. The only observed deficiencies were an area where a depression

had formed in the cap due to landfill settlement and areas around recently installed leachate head wells where vegetation needs to be re-established. Four roll-off boxes were placed on the cap to store soil cuttings generated when the leachate head wells were installed. The Site manager assured the inspector that the disturbed areas in the cap would be addressed and the roll-off boxes would be removed and disposed of properly, as soon as analytical results were obtained on the spoils they contain. Subsequent discussions with the Site manager confirmed these items were addressed and completed.

The blower flare station was operating and in good repair. Currently, the blower flare is operated on a six-hour on/off cycle due to low levels of methane gas generation. The WMWI project manager is evaluating operational options to deal with the decreasing quantity of methane gas.

Until recently, access to the Site on a portion of its northern boundary was restricted by a fence on the neighboring property. The neighboring property owner is in the process of removing the fence. The Site manager plans to extend the landfill fence to replace the one that is being removed.

Interviews

Mr. Thomas Wentland, Project Manager for WDNR, conducted interviews with various parties connected with the Site. Mr. Larry Buechel, the WMWI Project Manager, was interviewed on April 27, 2007. Mr. Buechel indicated that contaminant levels in the groundwater monitoring wells that WMWI samples are generally decreasing or stable. He also stated that he may research passive venting or other options to the current gas extraction system, because it is difficult to keep the central flare lit, due to the system not being able to collect enough gas. Mr. Buechel is also considering an annual report for the Site in addition to the quarterly reports that are currently prepared. He thought it might be helpful for evaluating the Site for the next five-year review. Ms. Karen Fielder, Waukesha County Solid Waste Supervisor was interviewed on May 25, 2007, and indicated that her office knows of no problems or complaints associated with the Site. Mr. Arlen Johnson, Director of Public Works for the Village of Menomonee Falls, was also interviewed on July 13, 2007, and reported that the Site has not been the source of any complaints. Mr. Robert Grosch, WMWI Engineer, was interviewed on June 21, 2007, and was not aware of any problems with the Site.

VI. Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

The answer to this question is yes for the following reasons:

The review of documents, Applicable or Relevant and Appropriate Requirements (ARARs), risk assumptions, and the results of the Site inspection indicate that the remedy is functioning as intended by the ROD. The capping of the Site and construction of the landfill gas extraction system has achieved the remedial objectives to reduce exposure to contaminants by ingestion and dermal contact, reduce off-site migration of landfill gas and groundwater,

minimize impact of the landfill to surface water, and maintain an inward groundwater gradient.

O&M of the cap and gas extraction system has been effective. A few small issues regarding cover maintenance and Site fencing need to be addressed. The landfill supervisor has indicated that these problems will be corrected.

The O&M Plan needs to be modified to include the new monitoring wells and leachate head wells. Current monitoring data supports that there is an inward gradient maintained on the Site as a whole. Additional monitoring points along the west side of the Site may be necessary to provide further evidence that the inward gradient exists in this area. New monitoring wells should be proposed to address this issue.

Institutional controls appear to prevent unauthorized excavation of the cap, groundwater use, and installation of water supply wells on the Site. Based on inspections and interviews, there appears to be compliance with the stated objectives of the use restrictions. Long-term protectiveness requires maintenance of the Site remedy components and compliance with ICs to ensure that the remedy continues to function as intended. Compliance with ICs will be ensured by U.S. EPA development of an IC plan in consultation with WDNR.

Question B: Are the exposure assumptions, toxicity data, clean-up levels, and remedial action objectives used at the time of remedy selection still valid?

The answer to this question is yes for the following reasons:

There have been no changes in the physical conditions of the Site that would affect the protectiveness of the remedy.

Changes in Standards and To Be Considered

ARARs that still must be met at this time are the WAC Chapter NR 140, Water Quality Standards. Operation of the Site indicates compliance with this ARAR. WAC Chapter NR 140 is in constant review and modification as new information on health related water quality parameters is discovered. The ROD requires that operation of the Site be conducted to comply with changes to WAC Chapter NR 140. As modifications to NR 140 are made, the criteria for evaluating water quality at the Site are updated through the WDNR GEMS database to identify any new water quality exceedances resulting from that update.

Changes in Exposure Pathways, Toxicity, and other Contaminant Characteristics

The exposure assumptions used to develop the Baseline Risk Assessment included both current exposures (older child/teenager trespassers) and potential future exposures (adult groundwater consumers). These assumptions are considered to be conservative and reasonable in evaluating risk and developing risk-based clean-up levels. There have been no known changes in risk assessment methodologies or toxicity factors that would affect the protectiveness of the remedy for the Site. Land uses in the vicinity of the Site have not changed and there are no known changes planned. There are no known new exposure pathways present at the Site. There have been no confirmed changes in contaminants or contaminant sources that call into question the protectiveness of the remedy, and the physical conditions at the Site remain

consistent with those that existed at completion of the remedy. No change to these assumptions or the clean-up levels developed from them is warranted.

Expected Progress Toward Meeting RAOs

The remedy is progressing as expected. The remedy, which is identified as containment, is functioning as designed. The system components are operating and being maintained as needed for continued operation. Data on remedy progress are compiled, evaluated, and routinely reported to WDNR.

Question C: has any other information come to light that could call into question the protectiveness of the remedy?

The answer to this question is no.

The Baseline Ecological Risk Assessment suggested that there would be no adverse affects to wildlife in the area from the chemicals at the Site. Greater protection now exists with the remedy in place than at the time the Baseline Ecological Risk Assessment was prepared, so it is logical to assume that less danger to the environment exists now than before. There have been no newly identified ecological risks at the Site.

No natural disasters have occurred in the vicinity of the Site that have adversely affected the protectiveness of the remedy.

There is no other information that calls into question the protectiveness of the remedy.

Technical Assessment Summary

According to the data reviewed, the Site inspection, and the interviews, the remedy is functioning as intended by the ROD. There have been no changes in the physical conditions of the Site that would affect the protectiveness of the remedy. Most groundwater clean-up goals, identified as ARARs in the ROD, have been met. Groundwater quality sampling results show exceedances of WAC NR 140 water quality standards. Continued implementation of the selected remedy at the Site is expected to result in eventually achieving those standards. There is no other information that calls into question the protectiveness of the remedy.

VIII. Issues

Issues	Affects Current Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
Possible increase in chloride and sulfate along eastern Site boundary.	N	Y
O&M Plan needs to address new monitoring and leachate head wells.	N	Y
Insufficient monitoring data to evaluate inward groundwater gradient on the west side of the Site.	N	Y
The ICs have not been fully evaluated.	N	Y
Long-term stewardship must be assured which includes maintaining and monitoring ICs.	N	Y

IX. Recommendations and Follow-up Actions

Issue	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness	
					Current	Future
Water Quality	Review chloride and sulfate concentrations on east side of Site to determine if additional evaluation is warranted.	WMWI	WDNR	April 2008	N	Y
Water Quality	Revise O&M Plan to include new monitoring and leachate head wells.	WMWI	WDNR	October 2007	N	Y
Groundwater Gradient	Identify and install any necessary monitoring points on west side of Site to evaluate gradients.	WMWI	WDNR	October 2008	N	Y
The ICs have not been fully evaluated.	A review of the institutional controls* is underway to assure that the remedy is functioning as intended with regard to the ICs and to ensure effective procedures are in-place for long-term stewardship at the Site.	WMWI	U.S. EPA/ WDNR	March 2008	N	Y
Long-term stewardship must be assured which includes maintaining and monitoring ICs.	An IC Plan will be developed which includes planning for additional IC evaluation activities as needed and planning for long-term stewardship.	U.S. EPA in consultation with WDNR	none	March 2008	N	Y

* Institutional control evaluation activities include preparation of paper and electronic versions of maps of all areas that require land and groundwater use restrictions; title work to confirm ownership and any prior-in-time inconsistent encumbrances; and review of ICs for effectiveness and enforceability. Also, long-term stewardship procedures shall be reviewed and a plan developed to provide for regular inspection of ICs at the Site and annual certification to WDNR that ICs are in place and effective. Additionally, use of a communications plan and use of a one-call system should be explored for long-term stewardship.

X. Protectiveness Statement(s)

The remedy at the Boundary Road Landfill Superfund Site is expected to be protective of human health and the environment when all groundwater clean-up goals are achieved. In the interim, exposure pathways that could result in unacceptable risks are being controlled.

Long-term protectiveness requires maintenance of the Site remedy components and compliance with ICs. Compliance with ICs will be ensured by implementing, maintaining, and monitoring ICs.

XI. Next Review

The next five-year review for the Boundary Road Landfill (fka Lauer 1 Landfill) is required by September 2012, five years from the date of this review.

Figures

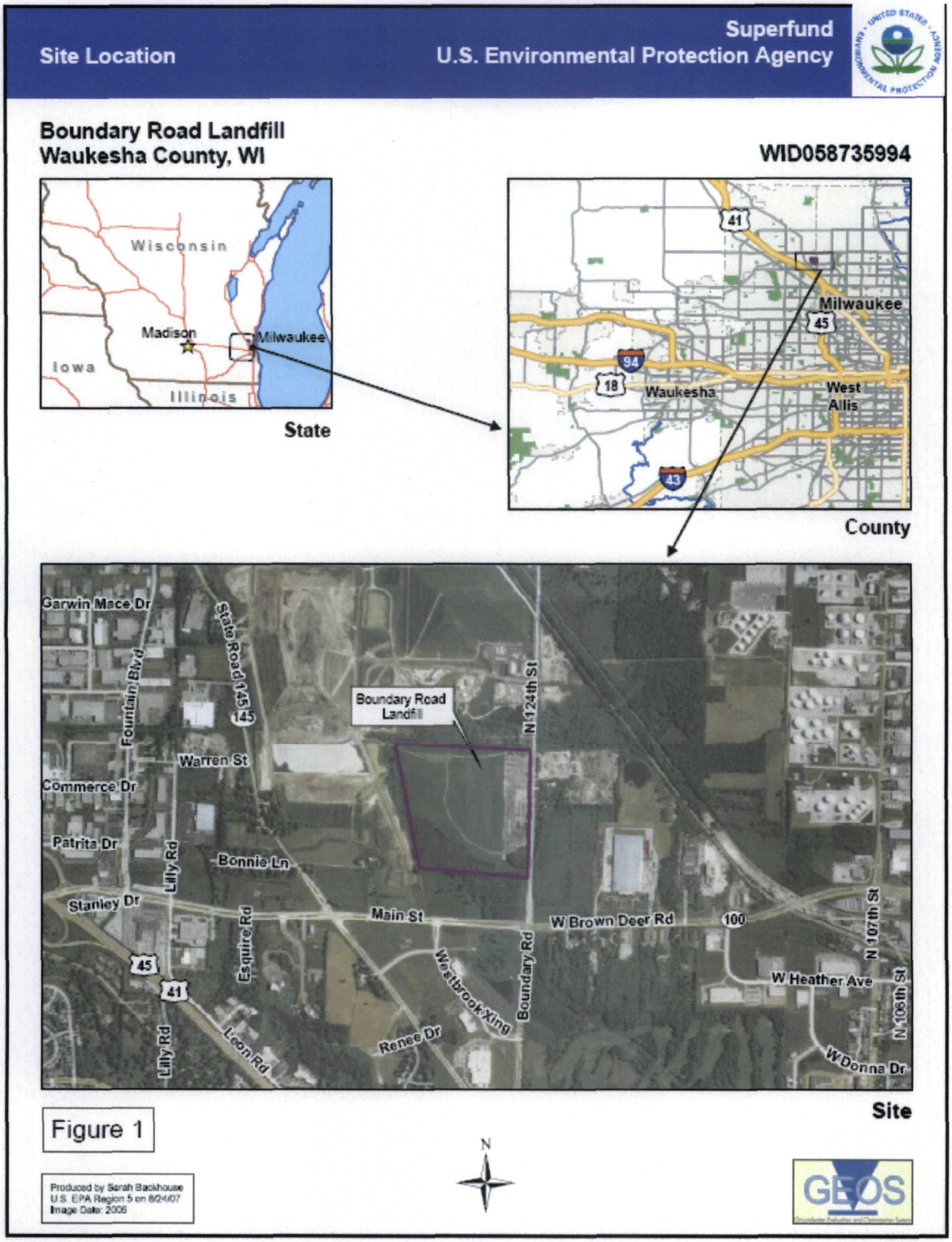


Figure 1: Map of the Boundary Road Landfill in Waukesha County, Wisconsin

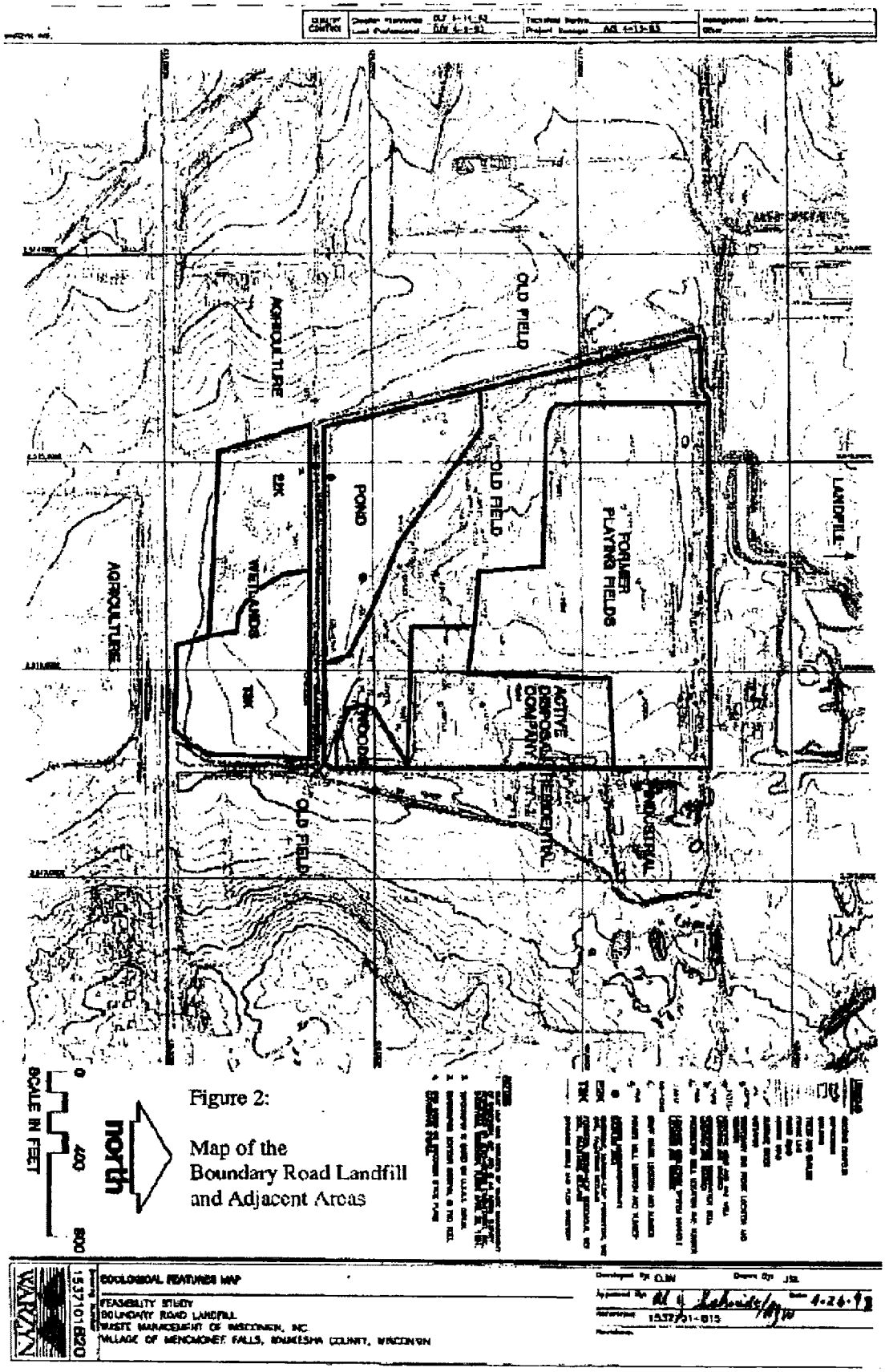
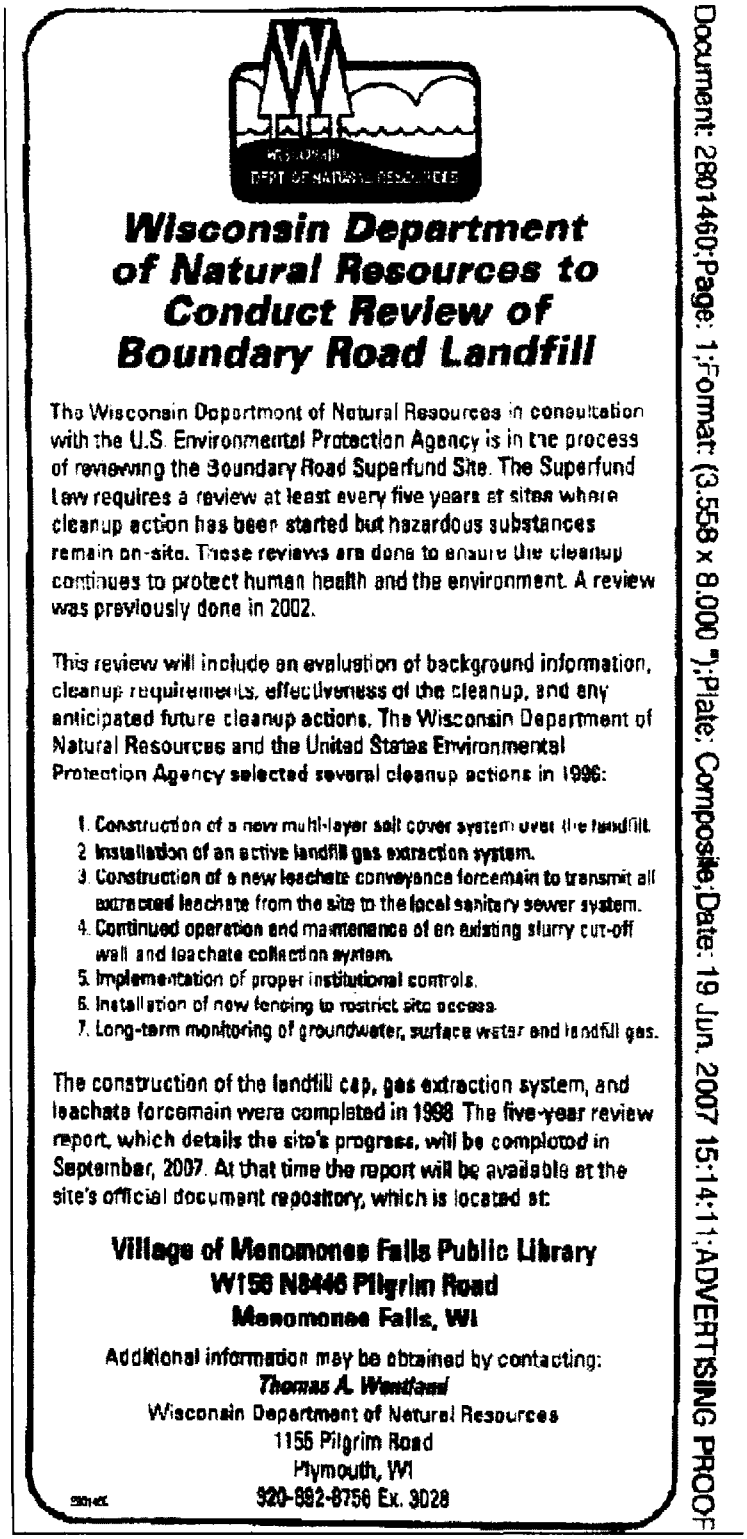


Figure 2: Map of the Boundary Road Landfill and Adjacent Areas

Attachments



Wisconsin Department of Natural Resources to Conduct Review of Boundary Road Landfill

The Wisconsin Department of Natural Resources in consultation with the U.S. Environmental Protection Agency is in the process of reviewing the Boundary Road Superfund Site. The Superfund law requires a review at least every five years at sites where cleanup action has been started but hazardous substances remain on-site. These reviews are done to ensure the cleanup continues to protect human health and the environment. A review was previously done in 2002.

This review will include an evaluation of background information, cleanup requirements, effectiveness of the cleanup, and any anticipated future cleanup actions. The Wisconsin Department of Natural Resources and the United States Environmental Protection Agency selected several cleanup actions in 1996:

1. Construction of a new multi-layer soil cover system over the landfill.
2. Installation of an active landfill gas extraction system.
3. Construction of a new leachate conveyance forcemain to transmit all extracted leachate from the site to the local sanitary sewer system.
4. Continued operation and maintenance of an existing slurry cut-off wall and leachate collection system.
5. Implementation of proper institutional controls.
6. Installation of new fencing to restrict site access.
7. Long-term monitoring of groundwater, surface water and landfill gas.

The construction of the landfill cap, gas extraction system, and leachate forcemain were completed in 1998. The five-year review report, which details the site's progress, will be completed in September, 2007. At that time the report will be available at the site's official document repository, which is located at:

Village of Menomonee Falls Public Library
W156 N8446 Pilgrim Road
Menomonee Falls, WI

Additional information may be obtained by contacting:
Thomas A. Westfahl
Wisconsin Department of Natural Resources
1155 Pilgrim Road
Plymouth, WI
920-892-8756 Ex. 3028

Attachment 1: Five-Year Review Newspaper Advertisement

1. Contract #SF-90-01, between Waste Management of Wisconsin and Wisconsin Department of Natural Resources, Effective Date: August 1, 1990.

2. First Five Year Review Report, Boundary Road Landfill, September 2002.

3. Boundary Road Landfill Quarterly Monitoring Reports, October 2002 through June 2007.

Attachment 2: List of Relevant Documents Reviewed